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CONTENTS

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THE LOCOMOTIVE WORLD

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THE FRANKLIN TYPE AND PRINTING COMPANY

H. C. HAMMACK, Editor

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THE FRANKLIN TYPE AND PRINTING COMPANY

Index to Advertisements, Page 15

HEAVY BUYING OF STEEL

THE demand for steel needed to fill orders for cars and locomotives is most urgent. Many large consumers, anxious to obtain assurances of steel shipments to cover manufacturing contracts, made frequent trips to Pittsburgh and Chicago, resulting in heavy future commitments by the mills. The steel companies, altho sold up to full capacity for six to nine months, are taking care of the requirements of needy consumers, but large merchant distributors are unable to replenish stocks.

Car shops have placed contracts for 135,000 tons of steel to cover the construction of 7000 cars, contracts for which were recently placed.

The railroads have inquiries out for about 16,000 cars, which will require 160,000 tons of steel.

For locomotives, orders which have been recently placed, 75,000 to 100,000 tons of steel will be required in construction of same.

All the above requirements, in addition to orders now on books of steel mills, will fill them to their capacity up to the fourth quarter of this year.

OUR TRADE

Without minimizing the importance of our wonderful growth in foreign trade we should regard it in proper perspective in looking at our total trade. Last year's foreign trade amounted to $5,350,000,000, an unprecedented volume, but the home trade is estimated to have reached the astounding total of $507,000,000,000. Foreign trade increased over 1914 $1,450,000,000, while domestic business gained $58,000,000,000. Manufactures totalled $30,000,000,000, or an increase of $4,000,000,000. Bank clearings were $187,000,000,000, or $32,000,000,000 increase. Country's wealth at the end of 1915 was computed at $218,000,000,000, or around $10,000,000,000 more than a year previous. This year's showing no doubt will be more remarkable in every respect, including the overwhelming proportion of home trade. All our foreign trade exports and imports combined since the close of the civil war amounted to less than one-fifth of domestic business in 1915.—*Business and Transportation World.*

Big Order Given

Locomotive Plant for 95 New Engines

The largest single order ever taken by the Lima Locomotive Corporation was placed on the books February 16th, when the New York Central System gave this firm a contract for 95 locomotives; 70 of which are to be of the Mikado type, cylinders 25″ x 32″, weight on drivers 215000 lbs, weight total 284000 lbs., boiler straight top type, diameter 80 inches, 7500 gallon Vanderbilt type tender. The remaining 25 locomotives are switchers, 0-8-0 type, cylinders 25″ x 30″, weight on drivers and total 239,500 lbs. These are among the heaviest switchers of this type in use in this country. This is the second order of any size taken by the reorganized company, the first one being an order for three large Santa Fe type locomotives for the Erie Railroad.

This large order from the New York Central System, together with other orders on the books of the company, will enable the new officials to start off their work with particularly brilliant prospects. Other orders now on the books are from Erie Railroad; Illinois Central Railroad; Central of Georgia Railroad; Toledo, St. Louis & Western Railroad; Cincinnati, Indianapolis & Western Railroad; Arthur Iron Mining Company; St. Paul Union Depot Company; Pennsylvania Lines West of Pittsburg.

In addition to large direct locomotive work for the trunk line railroads, this corporation does a big business in Shay Geared locomotives, and lighter rod locomotives for branch line railroads, industrial railroads, logging, mining and plantation railroads.

Some of the recent orders in this branch of their work are as follows:

70-ton Shay Locomotive for Turkey Foot Lumber Co., Lexington, Ky.

80-ton Shay Locomotive for Clear Lake Lumber Co., Clear Lake, Wash.

60-ton Shay Locomotive for Stimson Lumber Co., Seattle, Wash.

42-ton Shay Locomotive for Pioneer Lumber Co., Reform, Ala.

100-ton Shay Locomotive for Geo. Palmer Lumber Co., La Grande, Oregon.

28-ton Shay Locomotive for Cuban American Sugar Co., Havana, Cuba.

70-ton Shay Locomotive for Delta Land & Timber Co., Kansas City, Mo.

Two 13-ton Shay Locomotives for Board of County Commissioners of Wayne County, Detroit, Mich.

70-ton Shay Locomotive for Finkbine Lumber Co., D'lo, Miss.

Two 36-ton Shay Locomotives for Marble Cliff Quarries Co., Columbus, Ohio.

70-ton Shay Locomotive for Henderson Land & Lumber Co., Tuscaloosa, Ala.

Two 42-ton Shay Locomotives for Mr. Paris Charles, McVeigh, Pike County, Ky.

32-ton Shay Locomotive for Hume-Bennett Lumber Co., Sanger, Cal.

70-ton Shay Locomotive for Little River Lumber Co., Towsend, Tenn.

13-ton Shay Locomotive for R. D. Baker Co., Detroit, Mich.

Two 20-ton Shay Locomotives for Kelley Island Lime & Transport Company, Cleveland, Ohio.

70-ton Shay Locomotive for W. M. Carney Mill Co., Atmore, Ala.

50-ton Shay Locomotive for Western Cooperage Co., Knappa, Oregon.

60-ton Shay Locomotive for Blackwell Lumber Co., Couer de Alene, Idaho.

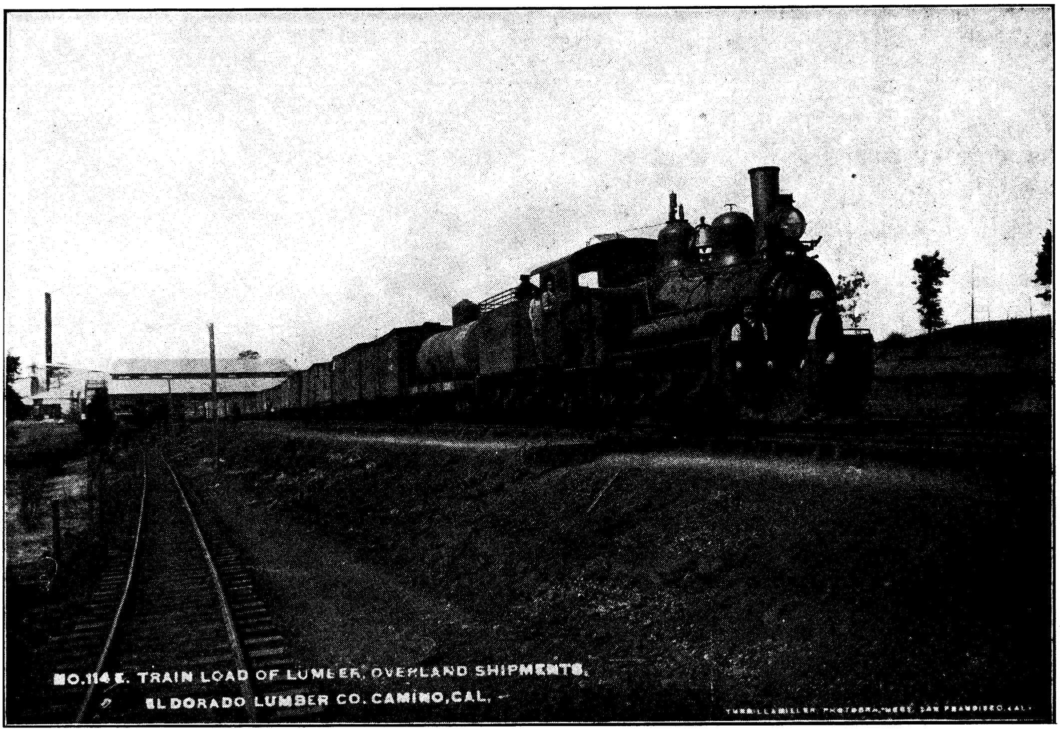
13-ton Shay Locomotive for Arkansas Construction Co., Little Rock. Ark.

36-ton Shay Locomotive for Goodman Lumber Co., Goodman, Wis.

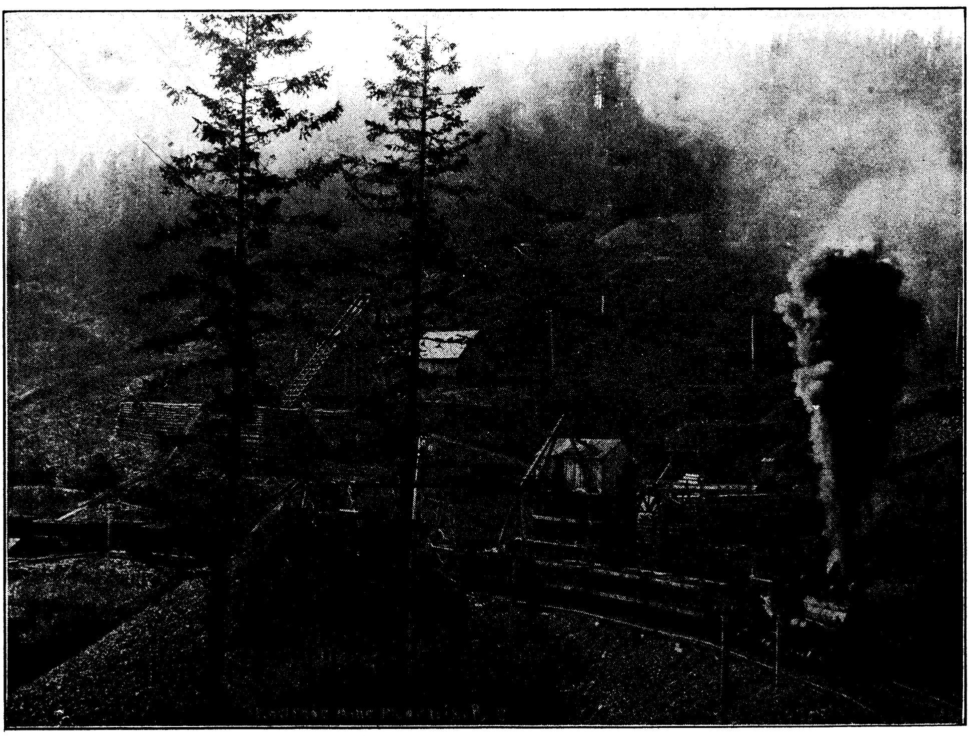
50-ton Shay Locomotive for Big Creek Logging Co., Knappa, Oregon.

60-ton Shay Locomotive for Sierra Nevada Wood & Lumber Co., San Francisco, Cal.

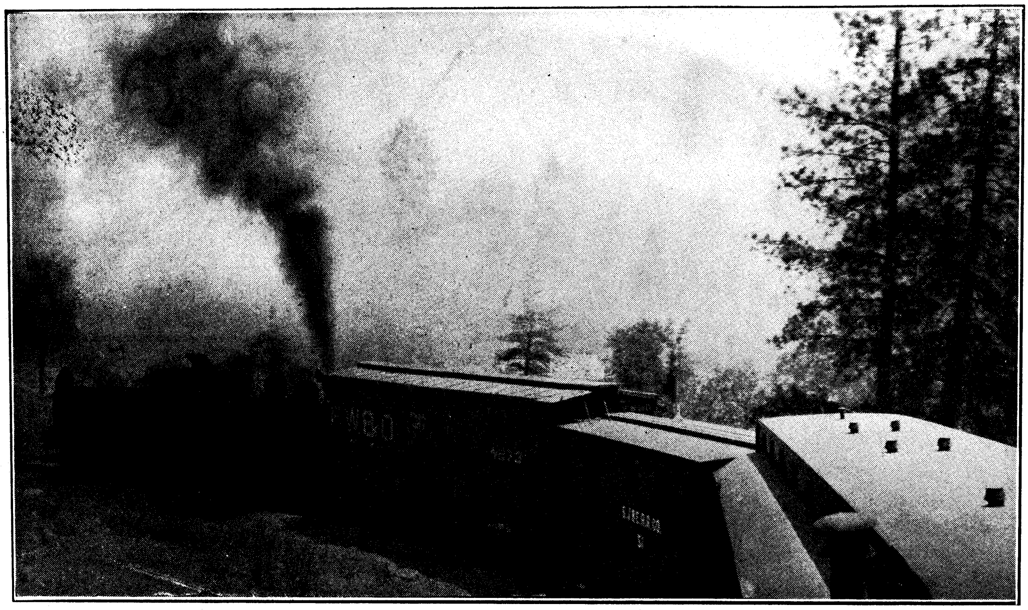
With the orders now on hand, and with prospects for additional business this plant will soon be taxed to its utmost capacity. It is not at all unlikely that enlargements in the capacity of the plant may be expected during this present year. The demand for locomotives just at present is most urgent, and the Lima Locomotive Corporation has a very brilliant future before it.



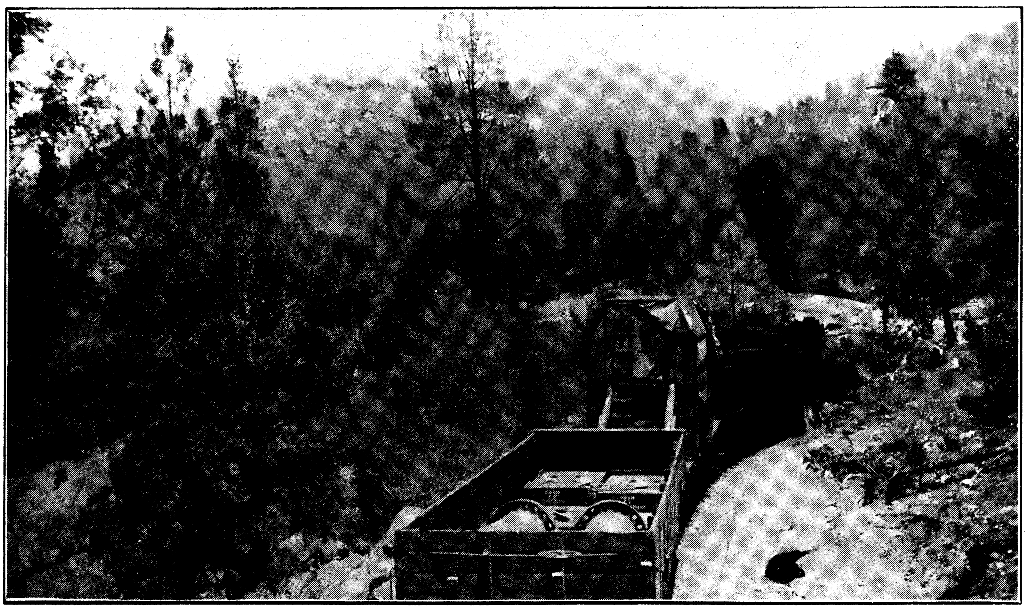
Scene on the Placerville & Lake Tahoe Railway, Placerville, California, showing 65 ton Shay Locomotive hauling train of 14 cars. This engine is running over track 8 miles long with continuous 3% grade, and with a climb of 1200 feet in the 8 miles.



Scene on Canadian Pacific Railroad of 100 Ton Shay Locomotive at work at the Snow Shoe Mine, Phoenix, British Columbia.



View of train on Big Creek Hydroelectric project in California,
75 ft. radius curve 60 ton 3 truck Shay.



Hauling machinery for Big Creek Hydroelectric project in California; 5% grade,
60 ton 3 Truck Shay Locomotive pulling the train.

Importance of Washing Locomotive Boilers

In the railroad shops, we find that there is no item quite so important in lessening running repairs as that of "washing boilers." If this is the case on our large railroad systems, where they have hundreds of locomotives in service, it should have the same effect in locomotives used on private railroads.

Some who are not familiar with the advantages in washing boilers may ask what is gained. In answer, statement can be made that the chief causes of leaky crown and staybolts is due to the collecting of scale or sediment, which could have been avoided if boiler had been given thorough washing at correct intervals. This collection of scale and sediment not only makes repairs necessary, but it has been found that a very small thickness of scale on heating surfaces will result in a loss in fuel.

It is not necessary to go into detail as to best method of washing boilers, but best results have been obtained by washing with hot water under steam pressure of at least 100 pounds per square inch.

The boiler should be washed through as many openings as available so as to reach every part of the boiler if possible. Sometimes the application of different sizes and forms of nozzles will have an added effect on loosening the scale, or forcing the sediment out. The life of a boiler depends on the care given it, and while there are other causes for an early failure of the firebox, tubes and outside shell of the boiler, one of the chief reasons is the accumulation of scale and sediment and allowing it to remain until same becomes encrusted so that removal is impossible.

If a boiler is taken early in its service and thoroughly cleaned at regular intervals, the scale and sediment can be washed into the legs or bottom of the boiler, where it can be easily removed through the plug openings. In washing a boiler, one of the most important things to always be kept in mind is to see that the washing apparatus is applied through every possible opening, so that every part of the boiler is reached.

After washing has been completed a careful inspection should be made to see that all scale and sediment is washed out, as frequently in washing, the scale will become loosened but will get clogged and not washed out, and if no inspection is made there will be no advantage gained.

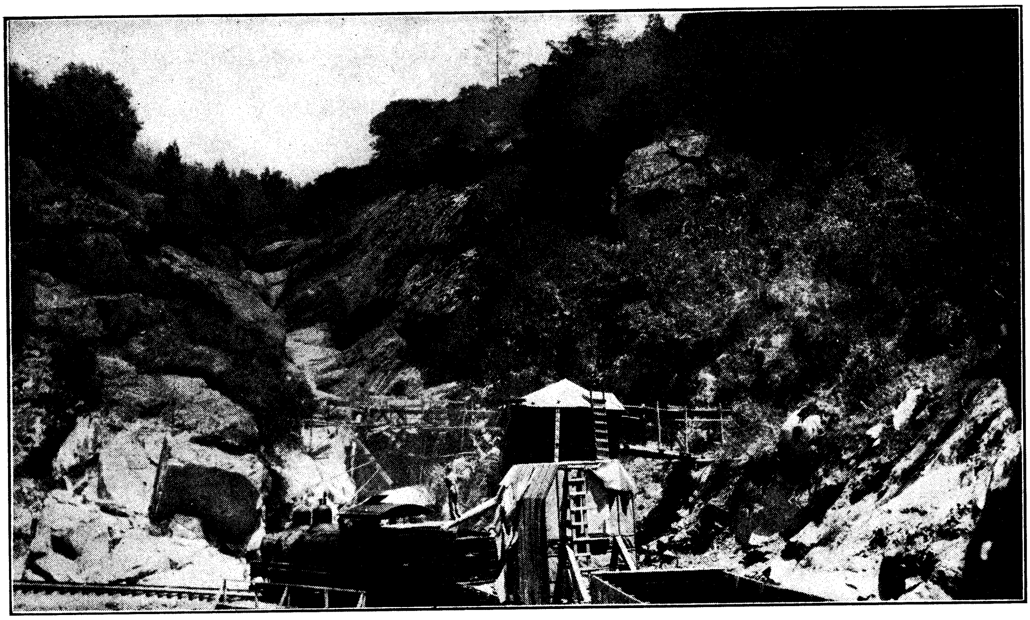
This subject may seem to be a trifling one, but the writer believes it to be one of great importance in reducing running repairs. Users of private locomotives should keep a record of boiler washings, and see that the washings are made at regular intervals. In other words, a system should be adopted and the matter followed closely, as it has been demonstrated that clean boilers show a great saving in fuel as well as in cost of repairs.

Questions and Answers.

FLANGE CUTTING

"I would like a little information on a locomotive repair job we have here, this on a Mikado type engine. The engine makes about two thirds of her mileage going ahead and the other third backing up, and cuts left front flange. In what way can this trouble be eliminated?"—*W. D.*

Answer.—There are several causes that would produce this effect, viz., excessive lateral in the engine truck or not enough weight on the engine truck, so that the truck would not do its share in guiding the engine. Again, the engine may be low on the left front corner, or the wheels may not be square with the frames. Would suggest that you look into the first two propositions first, and if there is no lateral play to speak of in the engine truck, and the engine sets level, the only thing left to do to eliminate excessive flange wear on the left front flange is to throw the right-hand wheels back. It may not be necessary to throw them back more than 1-16-inch, which can be done by placing shims or liners back of the shoes and pulling down the wedges to suit. Before doing this, however, the centers should be trammed, as if the trams show that the distance between the front and intermediate drivers on the left side is less than the distance between the front and intermediate drivers on the right side, it is clear that the engine is out of tram, and in that case, by throwing the right front wheel back so the engine will tram the same on both sides, the trouble may be overcome. If, however, the engine trams the same on both sides, then all wheels on the right side must be thrown back, keeping both sides in perfect tram. If the engine is O. K., and the flange wear is due to curved track and the engine making the greatest mileage in one direction, the only solution would be the application of a flange lubricator. In order to form an intelligent conclusion it would be necessary to study all conditions. Therefore, the above can only be taken as suggestions that may help to put you on the right track.—*Locomotive Firemen and Enginemens Magazine.*



On Big Creek Hydroelectric project in California, 60 Ton 3 Truck Shay Locomotive rounding a 75 ft. radius curve.

Engine Power and Train Resistance

It is highly important that railway companies should be able to decide how much of a train the various locomotives can pull and accordingly much time and attention have been devoted to finding out the amount of locomotive tractive powered train resistances under various conditions of operating. The tractive power of engines can easily be calculated, but finding the amount of resistance of the trains they are handling is a much more difficult problem. The various scientists who have labored on the problem of train resistance have nearly always tried to establish a formula of train resistance. When this formula or rule was carefully investigated it was generally found applicable only to the trains of one railway or even to one division.

At the 1914 convention of the American Railway Master Mechanics' Association a voluminous report was presented on Train Resistance and Tonnage Rating, which was full of rules, tables and formulae, but there is nothing in the report which a railway superintendent could use for instructing yard masters and others how the various locomotives should be loaded. There are figures showing the train resistance found on certain railroads, but they are not of general application. In fact, the resistance of a train is a quantity difficult to determine with accuracy. Conditions of lubrication, weather, condition of equipment, conditions of curves and track all count and they are rarely uniform. Then the wind resistance is an uncertain quantity, depending greatly upon how the wind strikes the cars.

Until about 1885 American railway officials were contented to use what was known the Clark formula for resistance of all kinds of trains and it was far too high. The formula is,

$$\frac{\sqrt{2}}{171} + 8 = R$$

That is square the velocity in miles per hour divide by 171 and add 8 pounds per ton for the constant resistance. By degrees railroad men came to understand that this rule gave too much resistance and they substituted 6 for 8 as the constant resistance, but that was still too high. There was nothing to indicate that the train resistance increased in the square of the speed in mile.

In 1885 Angus Sinclair, who had enjoyed long experience as a locomotive engineer and was persuaded that the rules for train resistance were worthless, made a series of tests with freight trains on the Burlington, Cedar Rapids & Northern Railway which proved that the accepted rules regarding train resistance were worthless. He met with so much

variety in the resistance of the different trains that he did not try to establish any fixed rule, holding as he did that it was necessary to investigate the resistance of every individual train.

In 1892 Angus Sinclair made a series of tests of locomotives pulling the Empire State Express to ascertain as accurately as possible the power required to pull the train at various speeds. In one of these runs a speed of 70 miles an hour was maintained for several miles and five indicator diagrams were taken when the locomotive was doing the work of maintaining the speed without loss or gain. The power developed indicated that the entire resistance of engine and train was 17.6 pounds per ton.

Arthur M. Wellington, a well known civil engineer who had devoted much time and exhaustive experiments on train resistances, remarked concerning Mr. Sinclair's test:

"The observations are among the most important evidences on record of the actual resistance of trains at high speeds. Perhaps we might even go farther and say that they are the most important, especially as they are reasonably consistent with the mean of the few other records which have been obtained for speeds of from 50 to 75 miles an hour, while presumably far more trustworthy and decisive than any of those prior records. As such they are a real contribution to technical knowledge."

After giving the leading particulars about the route, the train, the speed and the resistance recorded, Mr. Wellington made comparison of the data with those of a famous run made by Mr. William Stroudley on the London, Brighton & South Coast Railway; also with figures of train resistance found by Mr. P. M. Dudley with dynamometer car, and declared that Sinclair's figures had established figures worth being accepted as authority.

The various tests that have been made on other railroads since Mr. Sinclair made the tests of the Empire State Express indicate that his rule of resistance for fast passenger trains are entirely reliable. That rule does not, however, apply to freight trains.

Many railroad companies are now using dynamometer cars that record with accuracy the resistance of trains. We enjoyed the privilege at one time of spending considerable time in the dynamometer car operated by the Chicago, Burlington & Quincy Railroad, the greater part of its work having been done on freight trains. From notes taken on that car we learn that one train of loaded freight cars, weighing 940 tons, gave an average resistance of 5½ pounds per ton when running 20 miles an hour. A train of empty freight cars weighing 340 tons showed a resistance of 12 pounds per ton when running on a level track at 20 miles an hour. The records for resistance of passenger trains as shown by the dynamometer cars agree substantially by Sinclair's tests of the Empire State Express.

There is good reason for believing that the heavier the cars in a train are loaded, the smaller is the ton resistance, just as the case cited of loaded and empty cars. A particularly heavy train of freight cars on the New York, weighing with engine and tender 3,428 tons, gave resistance of only 4 pounds to the ton. The records of trains handled by the newest form of heavy engines when loaded close to their capacity seldom show a greater resistance than 4 pounds per ton at 20 miles an hour, when pulled over a straight track on a calm day.

A good illustration of the low rate of tonnage resistance in a particularly heavy train was found in a train hauled over a division of the Erie Railroad to test the hauling capacity of a new centipede locomotive. The train of 640 cars weighed 45,000 tons and the average train resistance on a level track was 3 pounds to the ton.

When officials are considering the elements that go to increase train resistance, too little attention, as a rule, is bestowed upon the resistance due to irregularities of track. When tracks are so defective that they fail to maintain the wheels revolving in parallel planes, the flanges of some of the wheels will keep grinding themselves on the rails, greatly increasing the resistance to motion. All these causes that make a train hard to pull must be taken into consideration when the tractive power of locomotives is under consideration, and many of these causes belong to the realm that may be classed as past finding out.—*Railway & Locomotive Engineering.*

Government Publications of Interest to Lumbermen

Among recent reports issued by the United States Department of Agriculture are an "Annual Report of the Forester for 1915," an "Annual Report of the Insecticide and Fungicide Board for 1915," and an "Annual Report of the Director of the Office of Public Roads." Anyone of these may be obtained free upon application to the editor and chief of the division of publications United States Department of Agriculture, Washington, D. C., as long as the department's supply lasts.

Railway Returns for the Fiscal Year 1915

The Bureau of Railway Economics has issued Bulletin No. 88, giving a summary of the principal railway statistics of Class 1 roads, those having gross earnings of over $1,000,000, for the fiscal year ending June 30, 1915. This is the first of a series of proposed annual publications which aims to present as soon as possible after the close of the fiscal year significant statistics of the more important railway systems compiled from their annual reports to the Interstate Commerce Commission. The Class 1 roads include approximately 89 per cent of the entire railway mileage of the country, and 97 per cent of the operating revenues. Emphasis is laid, in the introduction to the pamphlet, upon the fact that these figures are in no sense official. They are preliminary and tentative. Also, changes in the statistical and accounting regulations of the commission render it difficult, and in many cases impracticable, to compare the returns for 1915 with corresponding returns for previous years.

An average mileage of 228,330 miles of line is represented in the statistics. The income account, with comparisons for the previous year, is as follows:

Item	Amount 1915	Amount 1914	Increase 1915 over 1914
UNITED STATES			
Railway operating revenues	$2,870,913,815	$3,029,914,285	*$159,000,470
Railway operating expenses	2,020,823,953	2,202,782,882	*181,958,929
Net operating revenue	850,089,862	827,131,403	22,958,459
Railway tax accruals	133,219,085	135,730,764	*2,511,679
Uncollectible railway revenues	649,921	28,381	621,540
Railway operating income	716,220,856	691,372,258	24,848,598
Miscellaneous operating income	1,874,357	1,672,391	201,966
Total operating income	718,095,213	693,044,649	25,050,564
Non-operating income†	237,368,878	298,171,158	*60,802,280
Gross income	955,464,091	991,215,807	*35,751,716
Deductions from gross income:			
Interest on funded debt	386,483,143	376,241,333	10,241,810
Interest on unfunded debt	28,401,357	31,602,481	*3,201,124
All other deductions†	227,589,566	235,677,286	*8,087,720
Total deductions†	642,474,066	643,521,100	*1,047,034
Net income	312,990,025	347,694,707	*34,704,682
Disposition of net income:			
Dividend appropriations	169,563,440	205,914,908	*36,351,468
Income appropriated for investment in physical property	20,807,042	27,371,949	*6,564,907
Other income appropriations	12,890,736	12,681,240	209,496
Total appropriations of income	203,261,218	245,968,097	*42,706,879
Balance to credit of profit and loss	109,728,807	101,726,610	8,002,197

*Decrease.

†Because of accounting are not strictly comparable.

The total equipment of these lines in service on June 30, included 61,838 steam locomotives, 279 other locomotives, 2,286,596 freight train cars, 2,673 passenger train cars and 93,404 company service cars; 512,144 of the cars were of steel construction, including 501,309 freight cars, 6,014 passenger coaches and 4,821 other passenger cars; 676,270 cars were steel underframe construction.

The total investment in road and equipment to June 30, 1915, was $13,530,304,444, of which $322,489,825 represents investment during the year.

Tabulations relating to the compensation of employees are very scanty and incomplete, because of the failure of certain roads to make returns on account of changes in the regulations of the commission. The total number of employees, excluding general and division officers, is reported as 1,260,601, for a total of 197,959 miles, and the total compensation was $1,110,-084,052 for 213,000 miles. The number of general and division officers was 13,380 and their total compensation was $44,219,510. Excluding officers, the average annual compensation per employee was $813.17.

The total tonnage of revenue freight carried was 1,683,337,337, and the ton mileage of revenue freight was 273,758.173,613. The number of revenue passengers carried was 935,686,-180 and the number of revenue passenger miles, 31,859,712,578.

Some of the principal per mile statistics are shown in the following table:

Item	United States
AVERAGE PER MILE OF LINE:	
Operating revenues	$12,573.49
Operating expenses	$8,850.43
Net operating revenue	$3,723.06
Taxes	$583.45
Operating income	$3,136.77
Freight revenue	$8,660.26
Passenger revenue	$2,755.46
Passenger service train revenue	$3,431.00
Freight train-miles (freight train density)	2,355
Passenger train-miles (pass. train density)	2,444
Total revenue train-miles (train density)	4,930
Total revenue locomotive-miles	6,670
Total freight car-miles	87,590
Total passenger car-miles	14,097
Revenue ton-miles (freight density)	1,198,955
Revenue passenger-miles (pass, density)	139,533
AVERAGE PER MILE OF MAIN TRACK:	
Freight revenue	$7,536.95
Passenger revenue	$2,398.05
Passenger service train revenue	$2,985.97
AVERAGE PER TRAIN MILE:	
Operating revenues	$2.55
Operating expense	$1.80
Net operating revenue	$0.75
AVERAGE PER FREIGHT TRAIN-MILE:	
Freight revenue	$3.49
Loaded freight car-miles (loaded cars per train)	24
Empty freight car-miles (empty cars per train)	12
Total freight car-miles (cars per train)	36
Revenue ton-miles (tons per train)	483
AVERAGE PER PASSENGER TRAIN-MILE:	
Passenger revenue	$1.07
Passenger service train revenue	$1.33
Passenger car-miles (cars per train)	5.7
Revenue passenger-miles (passengers per train)	54
AVERAGE PER FREIGHT CAR-MILE:	
Revenue ton-miles (tons per loaded car)	21
Revenue ton-miles (tons per car)	14
Freight revenue—cents	15.32
AVERAGE PER PASSENGER CAR-MILE:	
Revenue passenger-miles (passengers per car)	15
Passenger revenue—cents	29.77
MISCELLANEOUS AVERAGES AND RATIOS:	
Operating ratio (per cent)	70.39
Average haul per ton—revenue freight—miles*	162.63
Average journey per passenger—miles*	34.05
Average receipts per ton-mile—cents	.722
Average receipts per passenger-mile—cents	1.975
Average tractive power per locomotive—pounds	31,883
Average capacity per freight car—tons	40
Average seating capacity per passenger car—coaches only	66

*On the individual railway.

The first table presents the name and operated mileage of the 170 railways covered by the summaries of the bulletin, listed according to districts. The tables next following give the significant statistics for the combined railways of each district and of the United States as a whole.—*Railway Age Gazette*

One of the commercial agents of the Bureau of Foreign and Domestic Commerce reports that the superintendent of a tramway and power company in Brazil desires to receive c. i. f. quotations on seasoned white ash, 4 by 4½ by 10 feet; seasoned white oak of the same dimensions; and first and second grade white ash and white oak boards 4x4 feet. The timber must be thoroughly dried. The man also desires to receive catalogs relative to car fixtures and railway supplies. Those interested should address the Chief of Bureau, Department of Commerce, Washington, D. C., referring to Daily Consular Report No. 17,847.

Directory of Railway, Locomotive, Engineering and Mining, and Lumber Journals.

INDEX TO ADVERTISERS AND WHAT THEY HAVE TO SELL